



**OPTIMIZATION AND EXPERIMENTAL
INVESTIGATIONS OF FUEL PROPERTIES WITH
ALGAE BIODIESEL USING DESIGN EXPERT
SOFTWARE**

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“I declare that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree”

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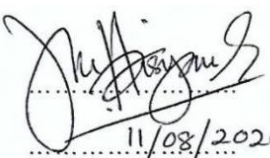
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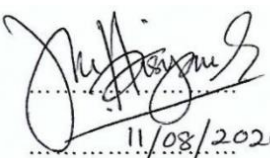
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ABSTRACT

Continuously growing world's energy demand and global climate change due to greenhouse gas emissions have created the needs to find out renewable and sustainable energy solution. One of the promising alternative energy solutions is by using algae biodiesel as it produces more oil compared to other sources and algae have higher growth rate without competing for arable land. However, there is still lack of investigations on the fuel properties of algae oil and its response on diesel engine when blended with diesel fuel. Thus the aim of this research is to investigate the fuel properties (viscosity and calorific value) and optimum blend of blended algae-diesel fuels by using design expert software. Different ratio of fuel blends of 5% (A5), 10% (A10), 15% (A15) and 20% (A20) of algae oil will be added with base diesel fuels were prepared for fuel properties measurement. Next, optimum blends of algae diesel blends was obtained by using the design expert software. Further analysis on the optimum blends was performed by using analysis of variance (ANOVA) and numerical optimization analysis. The results obtained shows that the 20A80D blends from the experiment has the fuel properties within the standard ASTM D6751 which are 0.172 Pa/s for viscosity and 39865 kJ/kg for calorific value. The optimum blends that has been determine was 4A96D blend which has the fuel properties within the range of the test standard. The percentage error between experimental and measured values was between less than 10% and can be acceptable. It can be concluded that this research shows that algae diesel blend is a potential candidate and a viable option to be blended with diesel fuel as an alternative fuel for the operation of diesel engine.